1. Determine if each statement below is always true or sometimes false.

   (a) $\int f(x)g(x)dx = \int f(x)dx \int g(x)dx$.
   Comment. Please make sure that they understand this is false, using example, etc.

   (b) To evaluate $\int \sin^{-1}(x)dx$ by just one time integration by part, choose $u = \sin^{-1}(x)$ and $dv = dx$.
   Comment. True.

   (c) To evaluate $\int x\ln(x)dx$ by just one time integration by part, choose $u = x$ and $dv = \ln(x)dx$.
   Comment. False. Explain that they can evaluate this integral using two by parts if they choose $dv = \ln(x)dx$.

   (d) To evaluate $\int \cot(x)dx$, integrate by substitution choosing $u = \sin(x)$.
   Comment. True.

2. evaluate the integrals.

   (a) $\int x^2 e^{x^3}$.
   Solution. $\frac{1}{3}e^{x^3}$. Use $u-$sub with $u = x^3$.

   (b) $\int x^3 e^{x^2}dx$.
   Solution. $(\frac{x^2}{2} - 1)e^{x^2}$. Help to apply $u-$sub and IBP.

   (c) $\int 4^{-x}dx$.
   Comment. $\frac{1}{\ln(4)}4^{-x} + C$. You can comment about $4^x = e^{x\ln(4)}$ and using $u-$sub. But they also have the table to do this integral.

   (d) $\int x^2 4^x dx$.
   Solution. $\frac{1}{\ln(4)}x^2 4^x - \frac{2}{\ln^2(4)}x4^x + \frac{2}{\ln^3(4)}4^x + C$. Help them apply IBP twice.

3. Determine if each integral below can be evaluated using a method we have learned so far (formula, u-substitution, integration by parts, or trig identities). If so, evaluate the integral. If not, explain why it cannot be evaluated.

   (a) $\int x^5 \ln(x)dx$.
   Solution. $\frac{x^6\ln(x)}{6} - \frac{x^6}{36} + C$. Help them understand that $u = \ln(x)$ is the best choice for IBP.

   (b) $\int \sin^5(2x)\cos^3(2x)dx$.
   Solution. $\frac{1}{12}\sin^6(2x) - \frac{1}{16}\sin^8(2x) + C$. Convert all except one of of cos to sin, i.e. $\cos^3(2x) = \cos(2x)(1 - \sin^2(2x))$.

(c) $\int \cos^2(3x)dx$.

Solution. $\frac{1}{2}x + \frac{1}{12}\sin(6x) + C$. Because $\cos^2(3x) = \frac{1+\cos(6x)}{2}$.

(d) $\int \tan(x)\ln(\cos(x))dx$.

Solution. $-\frac{1}{2}\left(\ln(\cos(x))\right)^2 + C$. We can use $u-$sub with $u = \ln(\cos(x))$.